

Road Noise Emission Model for CNOSSOS

Wolfram Bartolomaeus

Bundesanstalt für Straßenwesen, 51427 Bergisch Gladbach, Email: Bartolomaeus@bast.de

Introduction

In 2002 Environmental Noise Directive END [1] was introduced. So long, only (national) interim methods are developed to be used for the task of noise-mapping every five years. In the projects HARMONOISE [2] and IMAGINE [3] a harmonized method – across Europe and for the different noise sources: road, rail, flight and industry – was not finalized.

Since 2010 a new method CNOSSOS is under development to fill the gap for the third round in 2017. The new French model of NMPB will form the core of the CNOSSOS model for road noise.

Overview

The calculation of the emission from road vehicles within CNOSSOS having the following features:

- 4+1 vehicle categories for cars, light and heavy trucks, powered two wheelers + electric and hybrid vehicles
- Modeling of rolling and propulsion noise in octave bands as logarithmic res. linear functions of speed
- Obligatory corrections for temperature gradients, acceleration and deceleration and surface type
- Mandatory correction for studded tires

Comparison

First we can compare the emission levels in units of sound power level per unit length for the different methods, namely the German RLS-90 [4], the French NMPB [5] and CNOSSOS [6] (see Figures 1 and 2).

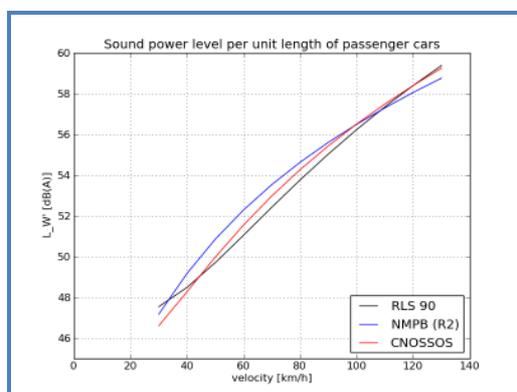


Figure 1: Sound power level per unit length as a function of speed for passenger cars

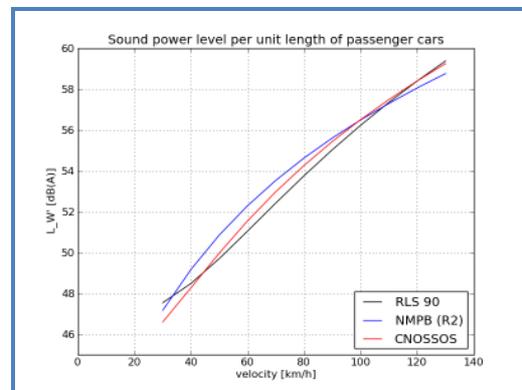


Figure 2: Sound power level per unit length as a function of speed for heavy vehicles

For passenger cars all lines are lying very close to each other. But for heavy vehicles the RLS-90 curve is about 3 dB(A) higher.

There were no surface corrections used for RLS-90 and CNOSSOS and the type R2 surface used for NMPB.

Gradient

The influence of the gradient is shown in Figures 3 and 4.

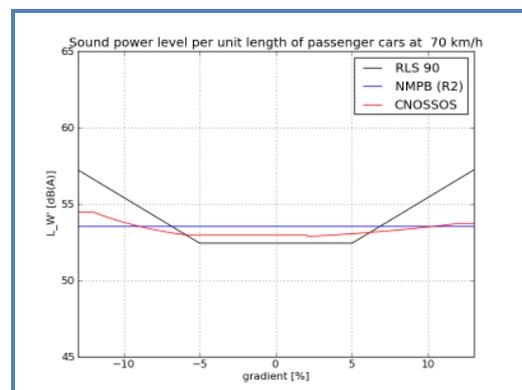


Figure 3: Sound power level per unit length as a function of gradient for passenger cars at 70 km/h

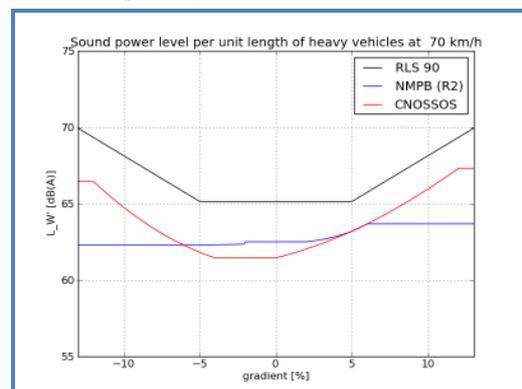


Figure 4: Sound power level per unit length as a function of gradient for heavy vehicles at 70 km/h

Disregarding the differences in absolute values the curves for RLS-90 and for CNOSSOS are very similar for heavy vehicles. The NMPB-approach is limited to a gradient of $\pm 6\%$. The results for CNOSSOS were derived from simulations using ROTRANOMO [7].

Crossings

The influence of crossings on the noise emission is modeled in different ways. In RLS-90 there is a stepwise correction to the immission level. In NMPB it is defined stepwise for a certain approaching and descending distance. In CNOSSOS we tried to suggest a smooth curve, derived from simulation results of ROTRANOMO [7]. In Figures 5 and 6 the differences of the time-averaged level with and without the extra influence of the crossing is shown for passenger cars at 30 km/h and for heavy vehicles at 50 km/h. The distance of the immission point to the middle of the road is 10 m.

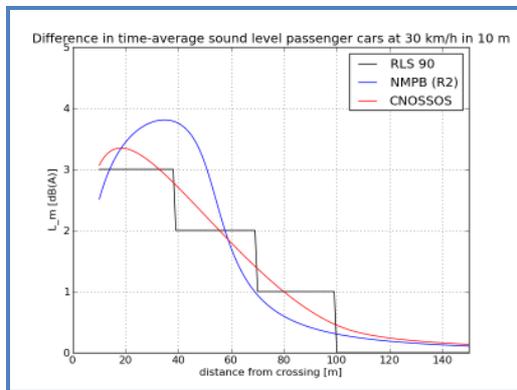


Figure 5: Difference in time-averaged sound level as a function of the distance from a crossing for passenger cars at 30 km/h in a distance of 10 m

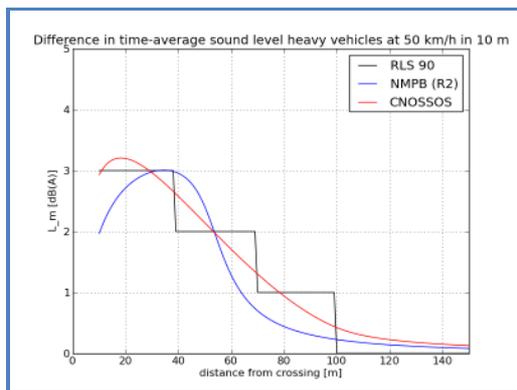


Figure 6: Difference in time-averaged sound level as a function of the distance from a crossing for heavy vehicles at 50 km/h in a distance of 10 m

Although the final values are not jet fixed in CNOSSOS the curves are quiet similar.

Next Steps

For the emission part of the future model called CNOSSOS the decision on which concept is to be used is very important. The amount and quality of input data – e.g. national databases and classification systems for the noise emission from different road surfaces – are heavily depending on the choice of propagation model also.

Now the main formulas are written down. But the next step will be to transfer the input values, specially the road correction values, to fit in the framework of the CNOSSOS road emission model.

In the view of renovating the national guidelines for noise abatement on roads RLS-90 the CNOSSOS model should be “as complex as necessary and as simple as possible”. Then there is a big chance to merge END and RLS in the future:

Why shall we model the reality of noise for different purposes in different ways?

Note

The official web-site of HARMONOISE does not longer exist. The web-sever of imagine-project.org gives no permission to access. This is a sign that the consortium of HARMONOISE/IMAGINE have given up.

References

- [1] DIRECTIVE 2002/49/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 25 June 2002 relating to the assessment and management of environmental noise
- [2] HARMONOISE, Harmonised Accurate and Reliable Methods for the EU Directive on the Assessment and Management of Environmental Noise, FINAL TECHNICAL REPORT, 1st March 2005
- [3] IMAGINE, Improved Methods for the Assessment of the Generic Impact of Noise in the Environment, The Noise Emission Model For European Road Traffic, 11th January 2007
- [4] Richtlinien für den Lärmschutz an Straßen, Bundesministerium für Verkehr, 1990
- [5] Emission sonore des véhicules – Guide méthodologique, Sétra, 5 mai 2008
- [6] Common NOise ASSEssment MethOdS in EU, CNOSSOS-EU, Draft, January 23rd 2012
- [7] TRANECAM and ROTRANOMO: ROTRANOMO; development of a Microscopic Road Traffic Noise Model for the Assessment of Noise Reduction Measures, PROJECT No. GRD2-2001-50091, 2005